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APR 11 1990

Richard G. Shepherd
Project Coordinator
Conestoga-Rovers & Associates, Inc.
O'Hare Corporate Towers One
10400 W Higgins Rd, Suite 103
Rosemont, IL 60018

Dear Mr. Shepherd:

Enclosed are copies of the sampling results, Quality Assurance data, Chain of Custody forms, and map illustrating the sampling locations for the twelve samples taken during U.S. EPA's and Illinois EPA's February 7, 1990 visit to the Johns-Manville-Waukegan, Illinois Site.

Please contact me at (312) 886-4742 if you have any questions concerning this letter or the enclosures.

Sincerely yours,

Brad Bradley
Remedial Project Manager

Enclosures

cc: Kurt Neibergall, IEPA
Eric Meyers, Waukegan

B13 4/7/90

bcc: L. Johnson, 5CS-TUB-03
M. Toney, 5CS-TUB-03
B. Kush, IL/IN #3

Randolph & Associates, Inc.
2201 W. Townline Road, Peoria, Illinois 61615
Telephone 309-692-4160 FAX 692-9364

ASBESTOS BULK SAMPLE EVALUATION
POLARIZED LIGHT MICROSCOPY (PLM) TECHNIQUE

Client: Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Springfield, Illinois 62706

Contact: Kurt Neibergall, Project Manager

Analysis: Routine/Unit Cost

Date Analyzed: 2/9/90

Date Received: 2/9/90

Client Reference: Johns Manville
Maywood

Client P.O.#:

RAI Job #: 2-0366-004.01

Type of Sample: Soil/Debris Samples **Sampled by:** Client **Analyst:** Anita Sumpter-Sturgies

					Fibrous Forms				
			Sample	Sample	Asbestos			Non-asbestos	Non-fibrous
Client I.D.	Client Code	RAI #	Description	Treatment	Type	%		Type	Components
Surface grab sample 50' east of NE corner, misc. pit (15' from east edge of roadway)	X-001	900209-03A	Two Components: 1) Brown, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 25-35 2) 65-75		1) None Detected 2) Cellulose 1-5%	1) Binder, quartz Total %:55-65 2) Binder, quartz Total %:10-20
East edge of road-80 yd. north of NE corner misc. pit (20' west of MW #7)	X-002	900209-04A	Two Components: 1) Black and grey, fibrous, non-friable 2) Grey and brown, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 30-40 2) >1-5		1) Cellulose TR 2) Cellulose TR	1) Binder Total %:50-60 2) Binder, quartz Total %:85-95

Analyst's Signature Anita Sumpter-Sturgies

Client: Illinois Environmental Protection Agency

Reference: Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	%	Non-asbestos Type	Non-fibrous Components
15' East of roadway-pipe/ siding debris 70 yds. from bend in road to west, -surface grab sample	X-003	900209-05A	Two Components: 1) Brown, fibrous, non-friable 2) Grey and brown, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile Amosite	1) 30-40 2) 10-20 10-20	1) Wollastonite 1-5% 2) Cellulose 1-5%	1) Binder, quartz Total %:45-55 2) Binder, quartz Total %:45-55
East edge of roadway-sludge / pipe-gravelly 30' north of MW5	X-004	900209-06A	Two Components: 1) Black, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 60-70 2) 70-80	1) None Detected 2) None Detected	1) Binder Total %:20-30 2) Binder Total %:10-20
Undercut-bank-indutrial canal (south side) approx. 20 yd.-west of new overflow structure	X-005	900209-07A	Grey, fibrous, friable	S, H	Chrysotile	50-60	Cellulose 5-10%	Binder Total %:20-30
1/2 way down west bank industrial canal -50" from NW corner (surface grab)	X-006	900209-08A	Three Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable 3) Black, fibrous, gelatinous	1) P, H 2) S, H 3) S, H	1) Chrysotile 2) Chrysotile Crocidolite 3) None Detected	1) >1-5 2) 20-30 40-50 3) None Detected	1) Cellulose TR 2) None Detected 3) Cellulose 60-70%	1) Binder Total %:85-95 2) Binder Total %:10-20 3) Binder Total %:20-30

Analyst's Signature ____________

Client: Illinois Environmental Protection Agency

Reference: Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	Fibrous Forms: Asbestos %	Fibrous Forms: Non-asbestos Type	Non-fibrous Components
Southeast corner-canal west of industrial canal crossover road 1E. (pumping lagoon)	X-007	900209-09A	Beige, fibrous, friable	S, H	Chrysotile Crocidolite	40-50 >1-5	Cellulose 25-35%	Binder Total %:5-10
Top of S. bank (west end) pumping lagoon & on bank (by pump house)	X-008	900209-10A	Two Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile Amosite	1) 5-10 2) 30-40 10-20	1) Cellulose 1-5% 2) Cellulose 10-20%	1) Binder, quartz Total %:75-85 2) Binder Total %:10-20
West bank pumping lagoon-midway down side-75' from SWcorner, gravelly bank-concrete dump area	X-009	900209-11A	Three Components: 1) Grey, fibrous, non-friable 2) Cream, fibrous, friable 3) Black, fibrous, sticky	1) P, H 2) S, H 3) S, H	1) None Detected 2) Chrysotile 3) Chrysotile	1) ----- 2) 60-70 3) 30-40	1) Cellulose TR 2) None Detected 3) Cellulose 25-35%	1) Binder, quartz Total%:90-100 2) Binder Total %:20-30 3) Binder Total %:15-25
Parking lot west of pumping lagoon and south (southwest) bank borrow lagoon	X-010	900209-12A	Three Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable 3) Black, fibrous, sticky	1) P, H 2) S, H 3) S, H	1) Chrysotile Amosite Crocidolite 2) Chrysotile 3) Chrysotile	1) 5-10 5-10 5-10 2) 30-40 3) 60-70	1) Wollastonite 1-5% 2) Cellulose 10-20% 3) None Detected	1) Binder, quartz Total %:55-65 2) Binder Total %:30-40 3) Binder Total %:20-30

Analyst's Signature

Client: Illinois Environmental Protection Agency **Reference:** Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	Asbestos %	Non-asbestos Type	Non-fibrous Components
W. of MW1-before hit RR ditch-grassy area	X-011	900209-13A	Two Components: 1) Grey, fibrous, non-friable 2) Black, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 20-30 2) >1-5	1) Cellulose 10-20% 2) Cellulose 20-30%	1) Binder Total %:40-50 2) Binder, quartz Total %:55-65
Hole-parking area-west of settling basin-8" hole dug under gravel	X-012	900209-14A	Two Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 30-40 2) 40-50	1) None Detected 2) None Detected	1) Binder Total %:50-60 2) Binder Total %:40-50

Analyst's Signature

NOTE:

Analysis of friable materials performed in accordance with "Interim Method of the Determination of Asbestos in Bulk Samples" by the U.S.E.P.A., 40 CFR Part 763, Subpart F, Appendix A, October 30, 1987. CAUTION: Airborne Asbestos fibers should be strictly avoided as should any activity which may cause the release of asbestos fibers from asbestos-containing materials. Percentages are analyst's best estimate.

This report must not be reproduced except in full and with the approval of the laboratory.
This report relates only to the items tested.

KEY: P=Pulverize H=Homogenize S=Shred N.F.=Non-fibrous Sb=Substantial Tr=Trace D=Dried A=Ashed
SE=Solvent Extraction

* The U.S.E.P.A. does not indicate the suitability of the aforementioned method for analysis of non-friable bulk samples. As such, the laboratory performs analysis of samples designated as "non-friable" utilizing alternate protocol as specified in the the laboratory Quality Assurance Manual.

Analyzed by: _____ Date 2/13/90

Report Approved by: _____ Date 2/13/90

Kirk E. Sweetland, Vice President

Client Reference: Illinois Environmental Protection Agency
Johns Manville, Maywood

RAI Job No.: 2-0366-004.01

this case, the record shall also include information on the location of these materials.

(2) No provision of this subpart applies to any school if:

(i) The local education agency has conducted abatement programs that result in the elimination of all friable asbestos materials from the school either by removal or encapsulation of the materials.

(ii) No part of the school building was built before January 1979.

119 References.

(a) *General.* The following reference contains detailed information on sampling and analysis of friable materials and provides a background on which this part is based. Copies may be obtained from the Document Control Officer, Management Support Division (TS 793), Office of Pesticides and Substances, Environmental Protection Agency, Room E-106, 401 M Street SW, Washington, D.C. 20460.

(1) USEPA. 1979. "Asbestos-Containing Materials in School Buildings: A Guidance Document" Part 1. (EPA no. C00090).

Appendix A to Subpart F—Interim Method of the Determination of Asbestos in Bulk Insulation Samples

Section 1. Polarized Light Microscopy

1.1 Principle and Applicability

Bulk samples of building materials taken for asbestos identification are first examined for homogeneity and preliminary fiber identification at low magnification. Positive identification of suspect fibers is made by analysis of subsamples with the polarized light microscope.

The principles of optical mineralogy are well established.[1,2] A light microscope equipped with two polarizing filters is used to observe specific optical characteristics of the sample. The use of plane polarized light allows the determination of refractive indices along specific crystallographic axes. Morphology and color are also observed. A retardation plate is placed in the polarized light path for determination of the sign of elongation using orthoscopic illumination. Orientation of the two filters such that vibration planes are perpendicular (crossed polars) allows observation of the birefringence and extinction characteristics of anisotropic particles.

Quantitative analysis involves the use of point counting. Point counting is a standard technique in petrography for determining the relative areas occupied by separate minerals in thin sections of rock. Background information on the use of point counting [3] and the interpretation of point count data [3] is available.

This method is applicable to all bulk samples of friable insulation materials submitted for identification and quantitation of asbestos components.

1.2 Range

The point counting method may be used for analysis of samples containing from 0 to 100 percent asbestos. The upper detection limit is 100 percent. The lower detection limit is less than 1 percent.

1.3 Interferences

Fibrous organic and inorganic constituents of bulk samples may interfere with the identification and quantitation of the asbestos mineral content. Spray-on binder materials may coat fibers and affect color or obscure optical characteristics to the extent of masking fiber identity. Fine particles of other materials may also adhere to fibers to an extent sufficient to cause confusion in identification. Procedures that may be used for the removal of interferences are presented in Section 1.7.2.2.

1.4 Precision and Accuracy

Adequate data for measuring the accuracy and precision of the method for samples with various matrices are not currently available. Data obtained for samples containing a single asbestos type in a simple matrix are available in the EPA report *Bulk Sample Analysis for Asbestos Content: Evaluation of the Tentative Method.*[4]

1.5 Apparatus

1.5.1 *Sample Analysis*

A low-power binocular microscope, preferably stereoscopic, is used to examine the bulk insulation sample as received.

- *Microscope:* binocular, 10-45X (approximate).
- *Light Source:* incandescent or fluorescent.
- *Forceps, Dissecting Needles, and Probes*
- *Glassine Paper or Clean Glass Plate*

Compound microscope requirements: A polarized light microscope complete with polarizer, analyzer, port for wave retardation plate, 360° graduated rotating stage, substage condenser, lamp, and lamp iris.

- *Polarized Light Microscope:* described above.

- *Objective Lenses:* 10X, 20X, and 40X or near equivalent.
- *Dispersion Staining Objective Lens* (optional)
- *Ocular Lens:* 10X minimum.
- *Eyepiece Reticle:* cross hair or 25 point Chalkley Point Array.
- *Compensator Plate:* 550 millimicron retardation.

1.5.2 *Sample Preparation*

Sample preparation apparatus requirements will depend upon the type of insulation sample under consideration. Various physical and/or chemical means may be employed for an adequate sample assessment.

- *Ventilated Hood* or negative pressure glove box.
- *Microscope Slides*
- *Coverslips*
- *Mortar and Pestle:* agate or porcelain. (optional)
- *Wylie Mill* (optional)
- *Beakers and Assorted Glassware* (optional)
- *Centrifuge* (optional)
- *Filtration apparatus* (optional)
- *Low temperature asher* (optional)

1.6 Reagents

1.6.1 *Sample Preparation*

- *Distilled Water* (optional)
- *Dilute CH_3COOH:* ACS reagent grade (optional)
- *Dilute HCl:* ACS reagent grade (optional)
- *Sodium metaphosphate* ($NaPO_3$)$_6$ (optional)

1.6.2 *Analytical Reagents*

Refractive Index Liquids: 1.490-1.570, 1.590-1.720 in increments of 0.002 or 0.004.

- *Refractive Index Liquids for Dispersion Staining:* high-dispersion series, 1.550, 1.605, 1.630 (optional).
- *UICC Asbestos Reference Sample Set:* Available from: UICC MRC Pneumoconiosis Unit, Llandough Hospital, Penarth, Glamorgan CF6 1XW, UK, and commercial distributors.
- *Tremolite-asbestos* (source to be determined)
- *Actinolite-asbestos* (source to be determined)

1.7 Procedures

NOTE: Exposure to airborne asbestos fibers is a health hazard. Bulk samples submitted for analysis are usually friable and may release fibers during handling or matrix reduction steps. All sample and slide preparations should be carried out in a ventilated hood or glove box with continuous airflow (negative pressure). Handling of samples without these precautions may result in exposure of the analyst and contamination of samples by airborne fibers.

1.7.1 *Sampling*

Samples for analysis of asbestos content shall be taken in the manner prescribed in Reference 5 and information on design of sampling and analysis programs may be found in Reference 6. If there are any questions about the representative nature of the sample, another sample should be requested before proceeding with the analysis.

1.7.2 *Analysis*

1.7.2.1 *Gross Examination*

Bulk samples of building materials taken for the identification and quantitation of asbestos are first examined for homogeneity at low magnification with the aid of a stereomicroscope. The core sample may be examined in its container or carefully removed from the container onto a glassine transfer paper or clean glass plate. If possible, note is made of the top and bottom orientation. When discrete strata are identified, each is treated as a separate material so that fibers are first identified and quantified in that layer only, and then the results for each layer are combined to yield an estimate of asbestos content for the whole sample.

1.7.2.2 *Sample Preparation*

Bulk materials submitted for asbesto analysis involve a wide variety of matrix materials. Representative subsamples may not be readily obtainable by simple mean in heterogeneous materials, and various steps may be required to alleviate the difficulties encountered. In most cases, however the best preparation is made by using forceps to sample at several places from the bulk material. Forcep samples are immersed in a refractive index liquid on a microscope slide, teased apart, covered with a cover glass, and observed with the polarized light microscope.

Alternatively, attempts may be made to homogenize the sample or eliminate interferences before further characterization. The selection of appropriate procedures is dependent upon the samples encountered and personal preference. The following are presented as possible sample preparation steps.

A mortar and pestle can sometimes be used in the size reduction of soft or loosely bound materials though this may cause matting of some samples. Such samples may be reduced in a Wylie mill. Apparatus should be clean and extreme care exercised to avoid cross-contamination of samples. Periodic checks of the particle sizes should be made during the grinding operation so as to preserve any fiber bundles present in a

identifiable form. The recommended for sam phibole minerals or ve amphiboles may resul fiber bundles or the p fragments with aspec 3:1. Grinding of v produce fragments wi er than 3:1.

Acid treatment ma quired to eliminate carbonate, gypsum, a are frequently pre: trowelled insulations. be removed by treatn acetic acid. Warm di may also be used to r rials. If acid treatmen sample at least twice being careful not to during decanting ste filtration of the suspr nificant fiber loss. Th should be 0.45 micror longed acid contact alter the optical char fibers and should be a

Coatings and bindi to fiber surfaces ma treatment with sod Add 10 mL of 10g/L solution to a small (0 bulk material in a tube. For approxima stir the mixture on a an ultrasonic bath an Repeat the series. solids by centrifugat minutes. Wash the suspending in 10 mL centrifuging. After w pellet in 5 mL distill of the suspension on dry the slide at 110° C

In samples with a l ic or other organic f to ash part of the sa due. Ashing should temperature asher. A

T

Mineral	Morp
Chrysotile (asbesti form serpen tine)	Wavy fibers splayed Aspect ra Colorless
Amosite (asbesti form grunerite)	Straight rigid typically brown, non sc Opaque present

identifiable form. These procedures are not recommended for samples that contain amphibole minerals or vermiculite. Grinding of amphiboles may result in the separation of fiber bundles or the production of cleavage fragments with aspect ratios greater than 3:1. Grinding of vermiculite may also produce fragments with aspect ratios greater than 3:1.

Acid treatment may occasionally be required to eliminate interferences. Calcium carbonate, gypsum, and bassanite (plaster) are frequently present in sprayed or troweled insulations. These materials may be removed by treatment with warm dilute acetic acid. Warm dilute hydrochloric acid may also be used to remove the above materials. If acid treatment is required, wash the sample at least twice with distilled water, being careful not to lose the particulates during decanting steps. Centrifugation or filtration of the suspension will prevent significant fiber loss. The pore size of the filter should be 0.45 micron or less. Caution: prolonged acid contact with the sample may alter the optical characteristics of chrysotile fibers and should be avoided.

Coatings and binding materials adhering to fiber surfaces may also be removed by treatment with sodium metaphosphate.[7] Add 10 mL of 10g/L sodium metaphosphate solution to a small (0.1 to 0.5 mL) sample of bulk material in a 15-mL glass centrifuge tube. For approximately 15 seconds each, stir the mixture on a vortex mixer, place in an ultrasonic bath and then shake by hand. Repeat the series. Collect the dispersed solids by centrifugation at 1000 rpm for 5 minutes. Wash the sample three times by suspending in 10 mL distilled water and recentrifuging. After washing, resuspend the pellet in 5 mL distilled water, place a drop of the suspension on a microscope slide, and dry the slide at 110° C.

In samples with a large portion of cellulosic or other organic fibers, it may be useful to ash part of the sample and view the residue. Ashing should be performed in a low temperature asher. Ashing may also be performed in a muffle furnace at temperatures of 500° C or lower. Temperatures of 550° C or higher will cause dehydroxylation of the asbestos minerals, resulting in changes of the refractive index and other key parameters. If a muffle furnace is to be used, the furnace thermostat should be checked and calibrated to ensure that samples will not be heated at temperatures greater than 550° C.

Ashing and acid treatment of samples should not be used as standard procedures. In order to monitor possible changes in fiber characteristics, the material should be viewed microscopically before and after any sample preparation procedure. Use of these procedures on samples to be used for quantitation requires a correction for percent weight loss.

1.7.2.3 *Fiber Identification*

Positive identification of asbestos requires the determination of the following optical properties.

- Morphology
- Color and pleochroism
- Refractive indices
- Birefringence
- Extinction characteristics
- Sign of elongation

Table 1-1 lists the above properties for commercial asbestos fibers. Figure 1-1 presents a flow diagram of the examination procedure. Natural variations in the conditions under which deposits of asbestiform minerals are formed will occasionally produce exceptions to the published values and differences from the UICC standards. The sign of elongation is determined by use of the compensator plate and crossed polars. Refractive indices may be determined by the Becke line test. Alternatively, dispersion staining may be used. Inexperienced operators may find that the dispersion staining technique is more easily learned, and should consult Reference 9 for guidance. Central stop dispersion staining colors are presented in Table 1-2. Available high-dispersion (HD) liquids should be used.

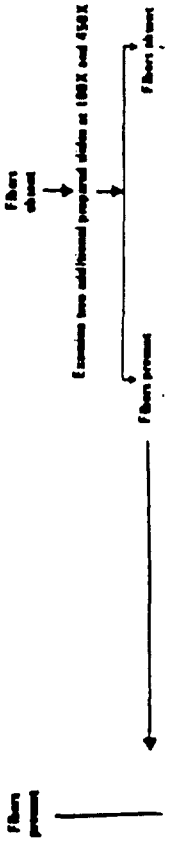
TABLE 1-1—OPTICAL PROPERTIES OF ASBESTOC FIBERS

Mineral	Morphology, color*	Refractive indices*		Birefringence	Extinction	Sign of elonation
		α	γ			
Chrysotile (asbestiform serpentine)	Wavy fibers Fiber bundles have splayed ends and kinks Aspect ratio typically >10 1 Colorless †, nonpleochroic	1 493–1 560	1 517–1 552' (normally 1 556)	008	to fiber length	- (length slow)
Amosite (asbestiform runorite)	Straight, rigid fibers Aspect ratio typically >10 1 Colorless to brown, nonpleochroic or weakly sc Opaque inclusions may be present	1 635–1 696	1 655–1 729' (normally 1 696–1 710	020–033	to fiber length	- (length slow)

TABLE 1-1—OPTICAL PROPERTIES OF ASBESTOC FIBERS—Continued

Mineral	Morphology, color[a]	Refractive indices[b]		Birefringence	Extinction	Sign of elonation
		α	γ			
Crocidolite (asbestiform Riebeckite).	Straight, rigid fibers. Thick fibers and bundles common, blue to purple-blue in color. Pleochroic. Birefringence is generally masked by blue color.	1.654–1.701	1.668–1.717[c] (normally close to 1.700).	.014–.016	‖to fiber length.	– (length fast)
Anthophyllite-asbestos.	Straight fibers and acicular cleavage fragments[d]. Some composite fibers. Aspect ratio <10:1. Colorless to light brown.	1.596–1.652	1.615–1.678[f].	.019–.024	‖to fiber length.	+ (length slow)
Tremolite-actinolite-asbestos.	Normally present as acicular or prismatic cleavage fragments[d]. Single crystals predominate, aspect ratio <10:1. Colorless to pale green.	1.599–1.668	1.622–1.688[f].	.023–.020	Oblique extinction, 10–20° for fragments. Composite fibers show ‖ extinction.	+ (length slow)

[a] From reference 5; colors cited are seen by observation with plane polarized light.
[b] From references 5 and 8.
[c] Fibers subjected to heating may be brownish.
[d] Fibers defined as having aspect ratio >3:1.
[e] ⊥ to fiber length.
[f] ‖To fiber length.



Polarized light microscopy analysis: For each type of material identified by examination of sample at low magnification. Mount specially dispersed sample in 1.550 RI liquid. (If using dispersion staining, mount in 1.550 HD.) View at 100X with both plane polarized light and crossed polars. More than one fiber type may be present.

Polarized light microscopy analysis: For each type of material identified by examination of sample at low magnification. Mount spacially dispersed sample in 1.550 RI liquid. (If using dispersion staining, mount in 1.550 HD.) View at with both plane polarized light and crossed polars. More than one fiber type may be present.

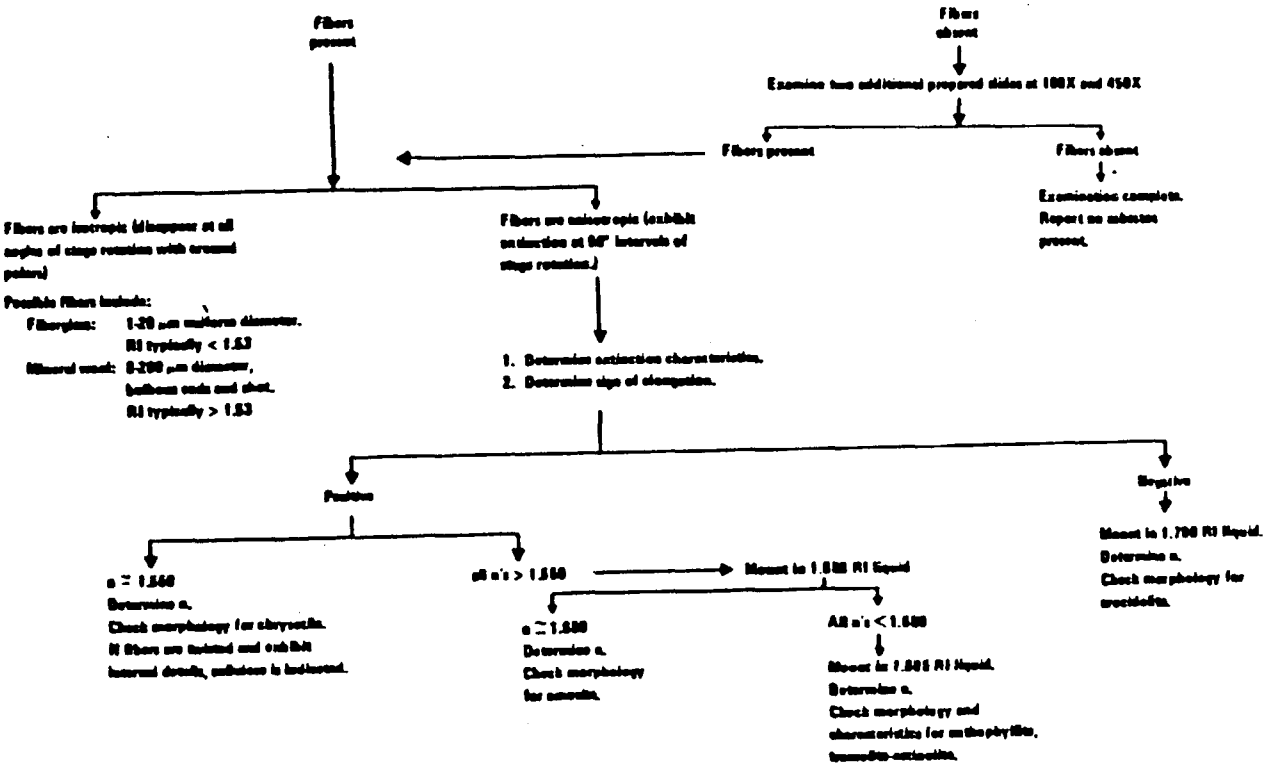


Figure 1-1. Flow chart for analysis of bulk samples by polarized light microscopy.

TABLE 1-2—CENTRAL STOP DISPERSION STAINING COLORS[a]

Mineral	RI Liquid	η⊥	η∥
Chrysotile	1.550[low]	Blue	Blue-magenta
Amosite	1.680	Blue-magenta to pale blue	Golden-yellow
	1.550[int]	Yellow to white	Yellow to white
Crocidolite[b]	1.700	Red magenta	Blue-magenta
	1.550[int]	Yellow to white	Yellow to white
Anthophyllite	1.605[int]	Blue	Gold to gold-magenta
Tremolite	1.605[int][c]	Pale blue	Gold
Actinolite	1.605[int]	Gold-magenta to blue.	Gold
	1.630[int][c]	Magenta	Golden-yellow

[a]From reference 9
[b]Blue absorption color.
[c]Oblique extinction view.

1.7.2.4 *Quantitation of Asbestos Content*

Asbestos quantitation is performed by a point-counting procedure or an equivalent estimation method. An ocular reticle (cross-hair or point array) is used to visually superimpose a point or points on the microscope field of view. Record the number of points positioned directly above each kind of particle or fiber of interest. Score only points directly over asbestos fibers or nonasbestos matrix material. Do not score empty points for the closest particle. If an asbestos fiber and a matrix particle overlap so that a point is superimposed on their visual intersection, a point is scored for both categories. Point counting provides a determination of the area percent asbestos. Reliable conversion of area percent to percent of dry weight is not currently feasible unless the specific gravities and relative volumes of the materials are known.

For the purpose of this method, "asbestos fibers" are defined as having an aspect ratio greater than 3:1 and being positively identified as one of the minerals in Table 1-1.

A total of 400 points superimposed on either asbestos fibers or nonasbestos matrix material must be counted over at least eight different preparations of representative subsamples. Take eight forcep samples and mount each separately with the appropriate refractive index liquid. The preparation should not be heavily loaded. The sample should be uniformly dispersed to avoid overlapping particles and allow 25-50 percent empty area within the fields of view. Count 50 nonempty points on each preparation, using either

- A cross-hair reticle and mechanical stage; or
- A reticle with 25 points (Chalkley Point Array) and counting at least 2 randomly selected fields.

For samples with mixtures of isotropic and anisotropic materials present, viewing the sample with slightly uncrossed polars or the addition of the compensator plate to the polarized light path will allow simultaneous discrimination of both particle types. Quantitation should be performed at 100X or at the lowest magnification of the polarized light microscope that can effectively distinguish the sample components. Confirmation of the quantitation result by a second analyst on some percentage of analyzed samples should be used as standard quality control procedure.

The percent asbestos is calculated as follows:

$$\% \text{ asbestos} = (a/n)\,100\%$$

where

a = number of asbestos counts,
n = number of nonempty points counted (400).

If a = 0, report "No asbestos detected." If $0 < a < 3$, report "<1% asbestos".

The value reported should be rounded to the nearest percent.

1.8 References

1. Paul F. Kerr, *Optical Mineralogy*, 4th ed., New York, McGraw-Hill, 1977.

2. E. M. Chamot and C. W. Mason, *Handbook of Chemical Microscopy, Volume One*, 3rd ed., New York: John Wiley & Sons, 1958.

3. F. Chayes, *Petrographic Modal Analysis: An Elementary Statistical Appraisal*, New York: John Wiley & Sons, 1956.

4. E. P. Brantly, Jr., K. W. Gold, L. E. Myers, and D. E. Lentzen, *Bulk Sample Analysis for Asbestos Content: Evaluation of the Tentative Method*, U.S. Environmental Protection Agency, October 1981.

5. U.S. Environmental Protection Agency, *Asbestos-Containing Materials in School Buildings: A Guidance Document*, Parts 1 and 2, EPA/OTS No. C00090, March 1979.

6. D. Lucas, T. Hartwell, and A. V. Rao, *Asbestos-Containing Materials in School Buildings: Guidance for Asbestos Analytical Programs*, EPA 560/13-80-017A, U.S. Environmental Protection Agency, December 1980, 96 pp.

7. D. H. Taylor and J. S. Bloom, Hexametaphosphate pretreatment of insulation samples for identification of fibrous constituents, *Microscope*, *28*, 1980.

8. W. J. Campbell, R. L. Blake, L. L. Brown, E. E. Cather, and J. J. Sjoberg, *Selected Silicate Minerals and Their Asbestiform Varieties: Mineralogical Definitions and Identification-Characterization*, U.S. Bureau of Mines Information Circular 8751, 1977.

9. Walter C. McCrone, *Asbestos Particle Atlas*, Ann Arbor: Ann Arbor Science Publishers, June 1980.

SECTION 2. X-RAY P

2.1 Principle a

The principle of X-r (XRD) analysis is w solid, crystalline mat impingent beam of pa X-rays whenever Brag

$\lambda = 2d \sin \theta$,

is satisfied for a part the crystal lattice, wh

λ = the X-ray wavelen
d = the interplanar sp flecting lattice pla
θ = the angle of inci ray beam and t planes.

By appropriate orient tive to the incident X tion pattern can be g cases, will be uniquely the chemical compos the crystalline phases

Unlike optical meth er, XRD cannot deter ogy. Therefore, in as does not distinguish nonfibrous forms of t phibole minerals (T when used in conj methods such as pola (PLM), XRD techniq able analytical meth tion and characteriz minerals in bulk mate

TABLE 2-2

Minerals
Chrysotile
"Amosite"
Anthophyllite
Anthophyllite
Crocidolite
Tremolite

*This information is intended be referred to, to ensure com amosite, crocidolite, tremolite.
[b]Fibrosity questionable

Accurate *quantitati* in bulk samples by XR ent on particle size d size, preferred orient sorption effects, and c ard reference and s

5.2.2.2 Carefully determine diameter (d) of Walton-Beckett graticule, use the following equation to determine MFA:

$$MFA = \pi (d/2)^2$$

5.2.3 Determining the Phase-Shift Detection Limit of Microscope

To be performed initially upon receipt of microscope and periodically thereafter. Procedure is as follows:

5.2.3.1 With 40X objective in place, focus sharply on the blocks of grooved lines on an HSE/NPL phase - contrast test slide.

5.2.3.2 In order for the microscope to be used for fiber counting the microscope optics must be capable of resolving the three most visible blocks of grooves clearly, the fourth and fifth most visible blocks at least partially, and the sixth and seventh blocks of grooves must be totally invisible. Failure may indicate that microscope has too high or low a resolution to be used for fiber counting.

5.2.3.3 Deterioration of resolution of a microscope may indicate need for cleaning and/or service of microscope

5.2.4 Determining Resolution of Analysts' Eyes

To be performed by each analyst at least annually.

5.2.4.1 Once microscope resolution has been established through the process described in 5.2.3, the analyst is asked to determine the number of blocks of grooved lines that they see. The analyst must make certain to adjust interocular distance and ocular focus for their use.

5.2.4.2. If analyst is unable to discern the fifth block of grooves at least partially, then the analyst is withheld from performing fiber-counting. Retesting will be permitted.

5.3.0 Polarized Light Microscope (PLM)

Calibration & Alignment from our Quality Assurance Manual

5.3.1 Alignment and Set-up

5.3.1.1 Initial

To be performed at the beginning of each work shift. It is assumed that analyst will adjust interpupillary distance and ocular focus to their best advantage.

5.3.1.1.1 With illumination on, analyzer out, and dispersion staining objective in line, focus on any prepared slide. Note: Be certain that no stop is in line of focus. Check with Bertrand lens.

5.3.1.1.2 Check centration of rotating stage and adjust with stage centering screws.

5.3.1.1.3 Close field and aperture diaphragms and rack condenser to bring field diaphragm into sharpest possible focus.

5.3.1.1.4 Center field diaphragm image with condenser centering screws. Open field diaphragm to just fill field of view with light.

5.3.1.1.5 Center other objectives using objective centering screws on rotating nosepiece.

Note: During use of microscope to examine samples, each time a different objective is rotated into place, field daphragm should be closed, focused and opened to just fill field of view. This should also be performed each time a different slide is examined. Objective centering should be corrected whenever it is observed to have changed.

5.3.1.2 Central Stop Alignment

To be performed following initial alignment described in 5.3.1.1 and before the beginning of each work shift.

5.3.1.2.1 With dispersion staining objective in line, insert Bertrand lens.

5.3.1.2.2 Bring largest central stop into field of view.

5.3.1.2.3 Center central stop so that as aperture diaphragm is closed, the image of the aperture diaphragm contracts behind the stop in a concentric fashion.

5.3.1.2.4 Remove Bertrand lens.

5.3.1.3 Polarizer Alignment

To be performed when new microscope is put into service or following moving of microscope. To be checked and adjusted periodically as needed.

5.3.1.3.1 Begin with red dots on intermediate attachment and microscope stand aligned. Bring 10X objective into light path.

5.3.1.3.2 Set both polarizer and analyzer at position "0" to attain "crossed filter" position. Insert analyzer.

5.3.1.3.3 Place orientation plate on the center of the stage.

5.3.1.3.4 Focus on edge of plate and rotate stage until it most darkens. Move orientation plate so that edge of plate nears x-axis cross line.

5.3.1.3.5 Withdraw analyzer.

5.3.1.3.6 Loosen observation tube clamping screw and rotate observation tube so that x-axis cross line is parallel to edge of plate. Retighten observation tube clamping screw.

5.3.1.3.7 Replace orientation plate with specimen slide, selecting a transparent area.

5.3.1.3.8 Insert analyzer.

5.3.1.3.9 Loosen polarizer clamping screw, rotate polarizer until darkest field is obtained. Tighten polarizer clamping screw.

5.3.2 Cross Line Reticle Calibration

To be performed when new microscope is put into service and/or when reticle or other optical elements are changed.

5.3.2.1 Place stage micrometer in center of stage. With 10X objective in light path and analyzer withdrawn, focus sharply on micrometer.

5.3.2.2 Line up micrometer with x-axis line of cross line reticle and carefully measure length of scale on reticle. Record measurement specifically for that objective.

5.3.2.3 Repeat measurement of reticle scale and recording of measurement for each objective on microscope.

5.3.2.4 Calculate length of reticle units for each objective using following formula:

$$\frac{\text{\# of micrometers measured}}{\text{crossline reticle units measured}} = \text{micrometers / crossline reticle unit}$$

Note: Not all PLMs in each lab will be equipped with a scaled crossline reticle. At least one PLM per lab is to have this accessory.

5.4 Adjustments to Optical Microscope for Individaul Analyst

Each analyst should routinely make these adjustments prior to use of a scope. Rechecking adjustments hourly is highly recommended to reduce eye strain.

5.4.1 Adjust interpupillary distance of oculars simply by pulling apart or pushing together by the knurled dovetail slides of the left and right eyepiece tubes. All microscopes used by RAI automatically compensate for changes in focal length that might be associated with this process.

5.4.2 Ocular focus and adjustments are performed by the following:

5.4.2.1 With interpupillary distance adjusted for analyst, cover the left eye and look into right eyepiece with right eye.

5.4.2.2 Focus the reticle by rotating the top lens of the ocular. Note: Reticle eyepieces are to always be inserted in right ocular tube.

5.4.2.3 With left eye still covered, focus sharply on very small object on a specimen slide with coarse and fine microscope focus knobs.

5.4.2.4 Uncover left eye, cover right eye. Using independent focusing adjustment at the base of the ocular, focus sharply on source particle as before for the left eye/left ocular combination.

All calibrations / verifications are to be documented in the daily Calibration Record form in each analyst's notebook.

5.5. Verification of the Refractive Index of Immersion Oils

The refractive index of all oils used routinely in the central stop dispersion staining method for PLM shall be verified semi-annually and/or when evidence suggests poor or deteriorating performance of the oil. Verification shall be performed through the use of a refractometer which has been calibrated and is capable of maintaining a constant temperature of 25 degrees C. At least one bottle of each commonly used oil (High Dispersion oils 1.55, 1.605 and 1.68) from each lot received shall be subjected to this verification procedure. In addition, RAI will maintain a set of oils of refractive indices 1.400-1.780 at increments of 0.004 which shall be calibrated/ verified on an annual basis.

5.6 Maintenance and Monitoring of HEPA Filter Hoods in the PLM Laboratory

RAI will provide Class I Biohazard HEPA-filter hoods for each bulk analysis workstation. Optimal flow rates will be verified through the use of a smoke test which shall be performed at a frequency of once per month. Each analyst will report any perceived deterioration of performance of their hood immediately to the Laboratory Operations Manager who will methodically isolate the source of the problem. In addition, each HEPA filter shall be routinely inspected for gross contamination. It is assumed that the HEPA filter is in good operating condition if the hood is capable of maintaining the inward velocity indicated in the manufacturer's specifications.

In the event that a HEPA filter becomes clogged or damaged and requires service, it shall be treated as an asbestos-containing material and be handled with the utmost care. The individual disassembling the unit shall wear a fitted respirator, double-bag the contaminated filter and dispose of it in a manner appropriate for asbestos waste.

NVLAP National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION

ASBESTOS FIBER ANALYSIS NVLAP LAB CODE 1408 00

Randolph & Associates, Inc.
8901 N. Industrial Rd.
Peoria, IL 61615
Kirk Sweetland Phone: 309-692-4160

Accreditation Renewal Date: April 1, 1990

NVLAP Test Method Code	Test Method Designation
18/A01	40 Code of Federal Regulations Chapter I (1-1-87 edition) Part 763, Subpart F, Appendix A, pages 293-299 or the current U.S. Environmental Protection Agency method for the analysis of asbestos in building materials by polarized light microscopy.

DEPARTMENT OF COMMERCE • UNITED STATES OF AMERICA •

For the National Institute of Standards and Technology

Copy

United States Department of Commerce
National Institute of Standards and Technology

NVLAP

Certificate of Accreditation

RANDOLPH & ASSOCIATES, INC.
PEORIA, IL

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 7 Code of Federal Regulations. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for

ASBESTOS FIBER ANALYSIS

April 1, 1990

Effective until

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Institute of Standards and Technology

Copy

Randolph & Associates, Inc.
2201 W. Townline Road, Peoria, Illinois 61615
Telephone 309-692-4160 FAX 692-9364

ASBESTOS BULK SAMPLE EVALUATION
POLARIZED LIGHT MICROSCOPY (PLM) TECHNIQUE

Client: Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Springfield, Illinois 62706

Contact: Kurt Neibergall, Project Manager

Analysis: Routine/Unit Cost

Date Analyzed: 2/9/90

Date Received: 2/9/90

Client Reference: Johns Manville
Maywood

Client P.O.#:

RAI Job #: 2.0366.004.01

Type of Sample: Soil/Debris Samples **Sampled by:** Client **Analyst:** Anita Sumpter-Sturgies

					Fibrous Forms			
Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Asbestos Type	%	Non-asbestos Type	Non-fibrous Components
Surface grab sample 50' east of NE corner, misc. pit (15' from east edge of roadway)	X-001	900209-03A	Two Components: 1) Brown, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 25-35 2) 65-75	1) None Detected 2) Cellulose 1-5%	1) Binder, quartz Total %:55-65 2) Binder, quartz Total %:10-20
East edge of road-80 yd. north of NE corner misc. pit (20' west of MW #7)	X-002	900209-04A	Two Components: 1) Black and grey, fibrous, non-friable 2) Grey and brown, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 30-40 2) >1-5	1) Cellulose TR 2) Cellulose TR	1) Binder Total %:50-60 2) Binder, quartz Total %:85-95

Analyst's Signature Anita Sumpter-Sturgies

Client: Illinois Environmental Protection Agency

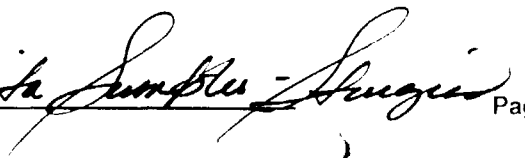
Reference: Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	Asbestos %	Non-asbestos Type	Non-fibrous Components
15' East of roadway-pipe/ siding debris 70 yds. from bend in road to west, -surface grab sample	X-003	900209-05A	Two Components: 1) Brown, fibrous, non-friable 2) Grey and brown, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile Amosite	1) 30-40 2) 10-20 10-20	1) Wollastonite 1-5% 2) Cellulose 1-5%	1) Binder, quartz Total %:45-55 2) Binder, quartz Total %:45-55
East edge of roadway-sludge / pipe-gravelly 30' north of MW5	X-004	900209-06A	Two Components: 1) Black, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 60-70 2) 70-80	1) None Detected 2) None Detected	1) Binder Total %:20-30 2) Binder Total %:10-20
Undercut-bank-indutrial canal (south side) approx. 20 yd.-west of new overflow structure	X-005	900209-07A	Grey, fibrous, friable	S, H	Chrysotile	50-60	Cellulose 5-10%	Binder Total %:20-30
1/2 way down west bank industrial canal -50" from NW corner (surface grab)	X-006	900209-08A	Three Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable 3) Black, fibrous, gelatinous	1) P, H 2) S, H 3) S, H	1) Chrysotile 2) Chrysotile Crocidolite 3) None Detected	1) >1-5 2) 20-30 40-50 3) None Detected	1) Cellulose TR 2) None Detected 3) Cellulose 60-70%	1) Binder Total %:85-95 2) Binder Total %:10-20 3) Binder Total %:20-30

Analyst's Signature

Client: Illinois Environmental Protection Agency **Reference:** Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	Asbestos %	Fibrous Forms: Non-asbestos Type	Non-fibrous Components
Southeast corner-canal west of industrial canal crossover road 1E. (pumping lagoon)	X-007	900209-09A	Beige, fibrous, friable	S, H	Chrysotile Crocidolite	40-50 >1-5	Cellulose 25-35%	Binder Total %:5-10
Top of S. bank (west end) pumping lagoon & on bank (by pump house)	X-008	900209-10A	Two Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile Amosite	1) 5-10 2) 30-40 10-20	1) Cellulose 1-5% 2) Cellulose 10-20%	1) Binder, quartz Total %:75-85 2) Binder Total %:10-20
West bank pumping lagoon-midway down side-75' from SWcorner, gravelly bank-concrete dump area	X-009	900209-11A	Three Components: 1) Grey, fibrous, non-friable 2) Cream, fibrous, friable 3) Black, fibrous, sticky	1) P, H 2) S, H 3) S, H	1) None Detected 2) Chrysotile 3) Chrysotile	1) ----- 2) 60-70 3) 30-40	1) Cellulose TR 2) None Detected 3) Cellulose 25-35%	1) Binder, quartz Total%:90-100 2) Binder Total %:20-30 3) Binder Total %:15-25
Parking lot west of pumping lagoon and south (southwest) bank borrow lagoon	X-010	900209-12A	Three Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable 3) Black, fibrous, sticky	1) P, H 2) S, H 3) S, H	1) Chrysotile Amosite Crocidolite 2) Chrysotile 3) Chrysotile	1) 5-10 5-10 5-10 2) 30-40 3) 60-70	1) Wollastonite 1-5% 2) Cellulose 10-20% 3) None Detected	1) Binder, quartz Total %:55-65 2) Binder Total %:30-40 3) Binder Total %:20-30

Analyst's Signature 

Client: Illinois Environmental Protection Agency **Reference:** Johns Manville

Client I.D.	Client Code	RAI #	Sample Description	Sample Treatment	Fibrous Forms: Asbestos Type	Asbestos %	Non-asbestos Type	Non-fibrous Components
W. of MW1-before hit RR ditch-grassy area	X-011	900209-13A	Two Components: 1) Grey, fibrous, non-friable 2) Black, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 20-30 2) >1-5	1) Cellulose 10-20% 2) Cellulose 20-30%	1) Binder Total %:40-50 2) Binder, quartz Total %:55-65
Hole-parking area-west of settling basin-8" hole dug under gravel	X-012	900209-14A	Two Components: 1) Grey, fibrous, non-friable 2) Grey, fibrous, friable	1) P, H 2) S, H	1) Chrysotile 2) Chrysotile	1) 30-40 2) 40-50	1) None Detected 2) None Detected	1) Binder Total %:50-60 2) Binder Total %:40-50

Analyst's Signature

NOTE:

Analysis of friable materials performed in accordance with "Interim Method of the Determination of Asbestos in Bulk Samples" by the U.S.E.P.A., 40 CFR Part 763, Subpart F, Appendix A, October 30, 1987. CAUTION: Airborne Asbestos fibers should be strictly avoided as should any activity which may cause the release of asbestos fibers from asbestos-containing materials. **Percentages are analyst's best estimate.**

This report must not be reproduced except in full and with the approval of the laboratory.
This report relates only to the items tested.

KEY: P=Pulverize H=Homogenize S=Shred N.F.=Non-fibrous Sb=Substantial Tr=Trace D=Dried A=Ashed
SE=Solvent Extraction

* The U.S.E.P.A. does not indicate the suitability of the aforementioned method for analysis of non-friable bulk samples. As such, the laboratory performs analysis of samples designated as "non-friable" utilizing alternate protocol as specified in the the laboratory Quality Assurance Manual.

Analyzed by: Anita Sumbler Thurgood Date 2/13/90

Report Approved by: Kirk E. Sweetland PCZ Date 2/13/90

Kirk E. Sweetland, Vice President

Client Reference: Illinois Environmental Protection Agency
Johns Manville, Maywood

RAI Job No.: 2.1602.001.01

IEPA -
CHAIN OF CUSTODY

Seal #: E. TAPE

Date Sealed: 2/6/90 By: AWW

Fac
Name
Regi
Coun

Site Inventory # :0971900014
Site Billing Code:LP-52195
Project Manager :KURT NEIBERGALL

	SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
[redacted]	X-012	2-7-90	3:25P

Sample Appearance : LIGHT BROWN - FIBROUS BOARD - LIGHT BROWN SANDY SOIL BELOW GRAVEL BASE LAYER

Collector Comments: HOLE - PARKING AREA / WEST ~~EAST~~ OF SETTLING BASIN - 8" HOLE DUG - UNDER GRAVEL

Sampler Signature : [redacted] Division/Company IEPA/DLPC/RPMS

[redacted]	ANALYSIS REQUESTED	FILTERING (Y/N)	Date	Time
		N/A		

KURT NEIBERGALL/STEVE DAVIS * LAST SAMPLE TODAY

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed intact into sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

[redacted]

Seal # E. TAPE

Date Sealed: 2/6/90 By: AWW

Site Inventory #: 0971900014

Site Billing Code: LP-52195

Project Manager: KURT NEIBERGALL

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X-011	2-7-90	3:15 PM

Sample Appearance: MPE PIPEGAS - SURFACE WALKOVER - GRAB

Collector Comments: W. OF MW1 - BEFORE HIT RR DITCH - GRASSY AREA - SANDY BROWN SOIL

Sampler Signature: [redacted] Division/Company IEPA/DLPC/RAMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	NO		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed intact into the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal # E-TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name [redacted]VILLE
Region [redacted]
County [redacted]

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X-010	2-7-90	3:00 PM

Sample Appearance : SLUDGE/PIPE WASTE - SURFACE WALKOVER COMPOSITE W/ SOUTHWEST END

Collector Comments: PARKING LOT WEST OF PUMPING LAGOON AND SOUTH (SW) BANK BOTTOM LAGOON BOTTOM LAGOON BANK - SLUDGE & PIPING W/ SANDY LOAM →

Sampler Signature : [signature] Division/Company IEPA/DLC/RAMS

ANALYSIS	FILTERING (Y/N)	Date	Time
[redacted]ESTOS	NA		

KURT NEIBERGALL / STEVE DAHL

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed intact in the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal # E-TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name
Region
County

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I D	SAMPLE DATE	SAMPLE TIME
X-009 GREY	2-7-90	2:40 PM

Sample Appearance : WHITE-CRUMBLY FIBER - SURFACE GRAB ON BANK - W/FIBER BOARD

Collector Comments: WEST BANK PUMPING LAGOON - MIDWAY DOWN SIDE - 15' FROM SW CORNER GRAVELLY BANK - CONCRETE DUMP AREA

Sampler Signature : [signature] Division/Company IEPA/DLPC/RPMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	NA		

KURT NEIBERGALL / STEVE DAULS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was [illegible] sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - [redacted]
CHAIN OF CUSTODY

Seal # E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name [redacted]VILLE
Region [redacted]
County [redacted]

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X-008	2-7-90	2:30 PM

Sample Appearance : COMPOSITE - SHINGLE SCRAPS / PIPE - WALKED AREA - BANK - BR. FIBROUS SLUDGE BY LAGOON EDGE
~~AREA WEST BANK~~ SOUTH BANK

Collector Comments: TOP OF S. BANK (WEST END) PUMPING LAGOON (ON BANK BY PUMP HOUSE)

Sampler Signature : [redacted] Division/Company IEPA/DLPC/RPMS

ANALYSIS	FILTERING (Y/N)	Date	Time
ASBESTOS	NO		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact.

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed [illegible] the sample shipping container and that I sealed the sample shipping container at the date and time listed below.

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA [redacted]
CHAIN [redacted]

Seal #: E. TAPE

Date Sealed: 2/6/90 By: AWW

Facil[redacted]
Name[redacted]
Re[redacted]
Co[redacted]

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X-007	2-7-90	2:25PM

Sample Appearance : BLUEISH GREY SLUDGE - TREE ROOT MASS - SOIL BROWN & SANDY

Collector Comments: ~~HWY 5E CORN.~~ - CANAL WEST OF INDUSTRIAL CANAL CROSSOVER ROAD (E. CP[redacted]G LAGOON)

Sampler Signature : [redacted] Division/Company IEPA/DLPC/RAMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	N-A-		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Da[redacted]: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed in an [redacted] sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY RECORD

Seal # E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility Name: [redacted]
Region:
County:

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

	SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
[redacted]	X1-006	2-7-90	2:15 PM

Sample Appearance : AC PIPE/ROOFING - SOIL MED. BROWN - SANDY - CHUNKY (SHINGLES - BLUESH - SLATE) SAMPLE - (SURFACE GRAB)

Collector Comments: ½ WAY DOWN WEST BANK INDUSTRIAL CANAL - 50' FROM NW CORNER

Sampler Signature : [redacted] Division/Company IEPA/DLPC/RPMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	NA		

KURT NEIBERGALL / STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed [illegible] the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal # E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name
Region
County

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X1-005	2-7-90	2:00 PM

Sample Appearance : BLUEISH-WHITE - FIBEROUS - LITTLE SOIL - SURFACE SLOPE CRAB

Collector Comments: UNDERCUT - BANK (SOUTH SIDE) - INDUSTRIAL CANAL ~ 30 YD. - W. OF NEW OVERFLOW STRUCTURE

Sampler Signature : [signature] Division/Company IEPA/DLC/RAMS

[redacted]

ANALYSIS	FILTERING (Y/N)	Date	Time
ASBESTOS	NA.		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed in the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal #: E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name: JOHNS-MANVILLE
Region: WAUKEGAN
County: LAKE

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

[redacted]

SAMPLE I.D	SAMPLE DATE	SAMPLE TIME
X-004	2-7-90	1:55PM

Sample Appearance : CHUNKY SLUDGE → FIBROUS - WHITE/BLUEISH GREY — BROWN SOIL MATRIX

Collector Comments: E. EDGE OF ROADWAY - SLUDGE/PIPE - GRAVELLY 30' N. OF MW5

Sampler Signature : [signature] Division/Company IEPA/OLPC/RPMS

[redacted]

ANALYSIS	FILTERING (Y/N)	Date	Time
ASBESTOS	NA.		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed into the sample shipping container and that I sealed the sample shiping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal #: E. TAPE
Date Sealed: 2/6/90 By: AWW

Facility
Name: [redacted] SITE
Region: [redacted]
County: [redacted]

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

	SAMPLE I D	SAMPLE DATE	SAMPLE TIME
[redacted]	X-003	2-7-90	1:50 PM

Sample Appearance : SOIL - DARK BROWN - W/ SLUDGE / MAN MADE MATERIALS →

Collector Comments: 15' EAST OF ROADWAY - PIPE/SIDING DEBRIS - SAMPLE SURFACE GRAB - CHUNKY MATERIALS - SOIL - SANDY GRAVEL W/ WHITE FIBER FROM BEND IN ROAD TO WEST

Sampler Signature : [signature] Division/Company IEPA/DLPC/RPMS

ANALYSIS	FILTERING (Y/N)	Date	Time
[redacted] ASBESTOS			

KURT NEIBERGALL / STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed intact in the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - CLP
CHAIN OF CUSTODY

Seal #: E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility
Name: [redacted] MANVILLE
Region: [redacted] WOOD
County: [redacted] LAKE

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager : KURT NEIBERGALL

	SAMPLE I.D	SAMPLE DATE	SAMPLE TIME
[redacted]	X-002	2-7-90	1:40 PM

Sample Appearance : E. EDGE OF ROAD - 80 YD. N. OF NE CORNER MISC PIT

Collector Comments: GRAVELLY/SANDY DARK BROWN - MIXED W/ WHITE CRUMBLY FIBROUS MATERIAL - MOIST (TOOK TOP 2" - SCRAPED - HARD AT 1' 20' WEST of MW#7)

Sampler Signature : [redacted] Division/Company IEPA/DLPC/RPMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	N.A.		

KURT NEIBERGALL/STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y / N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed into the sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

IEPA - OLP
CHAIN OF CUSTODY

Seal #: E. TAPE

Date Sealed: 2/6/90 By: AWW

Facility Name: [redacted]
Region: [redacted]
Code: [redacted]

Site Inventory # : 0971900014
Site Billing Code: LP-52195
Project Manager: KURT NEIBERGALL

[redacted]

SAMPLE I.D.	SAMPLE DATE	SAMPLE TIME
X-001	2-7-90	1:25 P

Sample Appearance : MED BROWN - SANDY SOIL - MOIST - SOME GRAVEL

Collector Comments: SURFACE GRAB SAMPLE 50' E. of NE CORNER MISC PIT (15' FROM E. EDGE OF ROADWAY)

Sampler Signature : [signature] Division/Company IEPA/DLPC/RPMS

[redacted]	ANALYSIS	FILTERING (Y/N)	Date	Time
	ASBESTOS	N.A.		

KURT D. NEIBERGALL / STEVE DAVIS

CHAIN OF CUSTODY CHRONICLE

I certify that I received the sample shipping container with the shipping container sealed and intact

Opened by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____ Intact?: Y N

I certify that the sample listed above was collected and placed in bottles in my presence, that each bottle was placed [illegible] sample shipping container and that I sealed the sample shipping container at the date and time listed below

Sealed by (print): _____ Signature: _____

Date: _____ Time: _____ Seal #: _____

Courier - sample pickup: _____

[redacted]

SAMPLING MAP OF 2-7-90 BY BRAD BRADLEY (US-EPA) E. MEYERS (EDI) KURT NEIBERGAUL (IEPA) AND STEVE DAVIS (IEPA) SAM JUNG (C.R.A. MANVILLE)